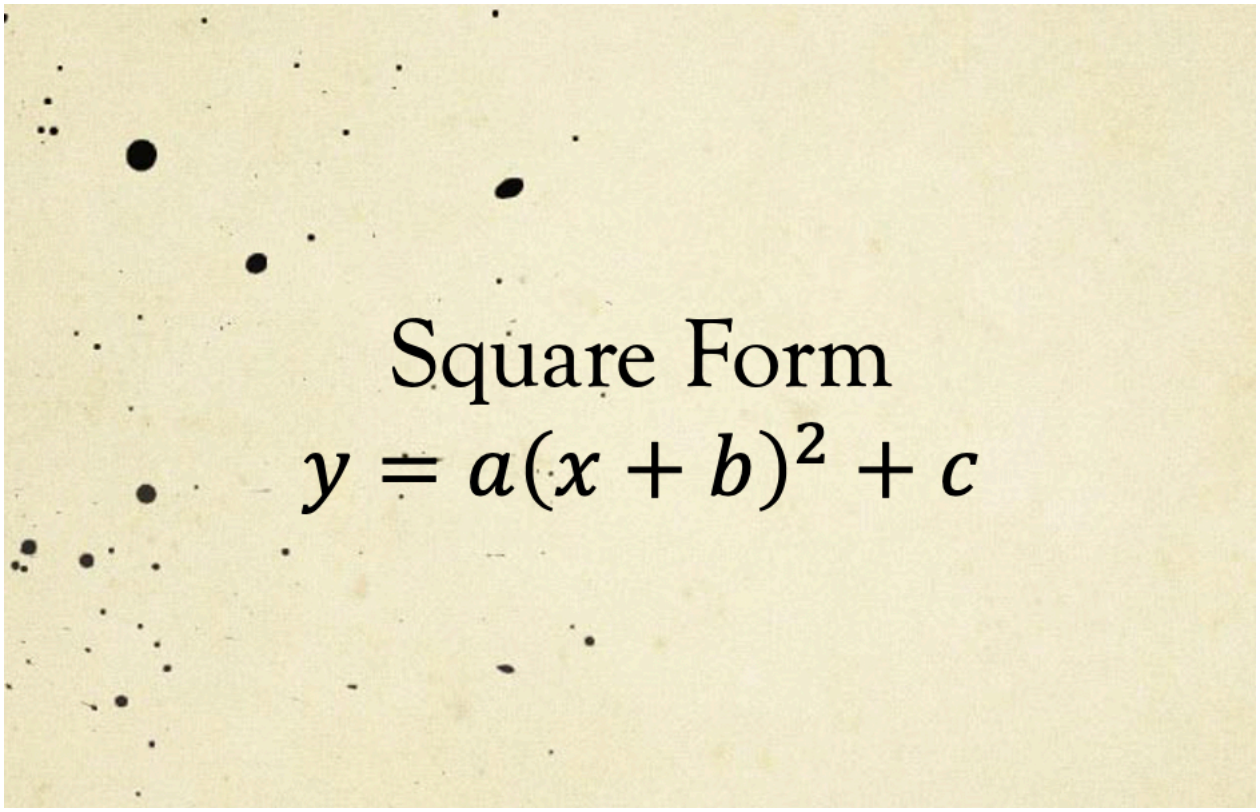


Name: _____

Table of Contents

NOTES:

Recap from eLearning Module

Basic Example

Rearrange this Quadratic in the form $(x+a)^2+b$

$$x^2+6.5x-11$$

$$x^2+6.5x+10.5625-11-10.5625$$

$$(x^2+6.5x+10.5625)-21.5625$$

$$(x+3.25)^2-21.5625$$

Advanced Example

Express the following Quadratic in the form $y=a(x+b)^2+c$

$$y=3x^2-11x+5$$

$$y=3\left(x^2-\frac{11}{3}x+\frac{5}{3}\right)$$

$$y=3\left(x^2-\frac{11}{3}x+\frac{121}{36}+\frac{5}{3}-\frac{121}{36}\right)$$

$$y=3\left(\left(x-\frac{11}{6}\right)^2-\frac{61}{36}\right)$$

$$y=3\left(x-\frac{11}{6}\right)^2-\frac{61}{12}$$

Applications

Applications of Square Form $(x+a)^2+b$

Algebra

$$f(x)=x^2-4x-12$$

$$x^2-4x+4-12-4$$

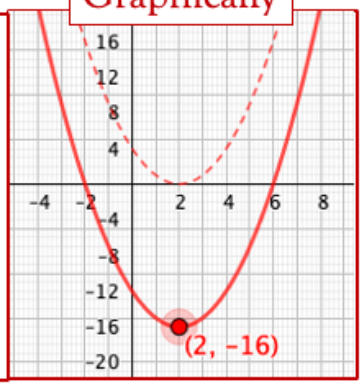
$$(x^2-4x+4)-16$$

$$(x-2)^2-16$$

Minimum Point:

(2,-16)

Graphically



NOTES:

Exam Papers

Ex.1: 2017 Leaving Cert

Question 1 **(25 marks)**

(a) Write the function $f(x) = 2x^2 - 7x - 10$, where $x \in \mathbb{R}$, in the form $a(x+h)^2 + k$, where a, h, and $k \in \mathbb{Q}$.

(b) Hence, write the minimum point of f.

(c) **(i)** Explain why f must have two real roots.

(ii) Write the roots of $f(x) = 0$ in the form $p \pm \sqrt{q}$, where p and $q \in \mathbb{Q}$.

page

NOTES:

Ex. 2: DEB 2020

Question 5 **(25 marks)**

(a) The quadratic function f is defined as $f(x) = x^2 + 2x + 9$, where $x \in \mathbb{R}$.

(i) Find the range of values of x for which $f(x) > 12$.

(ii) Find the set of values of k for which $f(x) = kx$ has no real roots.

(iii) Write $f(x)$ in the form $(x + a)^2 + b$, where $a, b \in \mathbb{Q}$, and hence find the largest value of $\frac{1}{f(x)}$.

NOTES:

Ex. 3: DEB 2016

Question 2 **(25 marks)**

The functions f and g are defined for $x \in \mathbb{R}$ as

$$f: x \mapsto 1 - x \qquad \text{and}$$
$$g: x \mapsto 2x^2 - 9.$$

(a) Given that the function $h(x) = g \circ f(x)$, show that $h(x) = 2x^2 - 4x - 7$.

(b) **(i)** Express $h(x)$ in the form $a(x + b)^2 + c$, where a, b and c are constants.

(ii) Hence, or otherwise, find the co-ordinates of the turning point of the function $h(x)$.

(c) The function $k(x)$ is the image of $h(x)$ under a translation. The co-ordinates of the turning point of $k(x)$ are $(-1, -5)$. Find $k(x)$.

NOTES: